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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,312	02/21/2002	Won Bang	2929D1/TCG/PMD/LE	6198
32588	7590	07/23/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MARKHAM, WESLEY D	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 07/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/081,312	BANG ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Acknowledgement is made of the amendment filed by the applicant on 5/7/2004, in which a new title of the invention was submitted, the specification of the instant application was amended, and Claims 10 – 19 were added. **Claims 1 – 19** are currently pending in U.S. Application Serial No. 10/081,312, and an Office Action on the merits follows.

Drawings

2. The formal drawings (2 sheets, 5 total figures) filed by the applicant on 2/21/2002 are acknowledged and approved by the examiner.

Specification

3. The objections to the specification, set forth in paragraphs 4 and 5 of the previous Office Action (i.e., the non-final Office Action mailed on 2/10/2004), are withdrawn in light of the applicant's amendment in which (1) an acceptable title of the invention was submitted and (2) the specification was amended to correct a typographical error and to clarify confusing language regarding the chamber pressure.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 13, 16, and 17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.
6. Specifically, newly added **Claim 13** requires coating the component part by PVD, wherein the coating is performed at a temperature of at least about 600° C. After reviewing the specification as a whole, the examiner notes that there is no discussion or disclosure, either explicit, implicit, or inherent, of depositing the coating by PVD (e.g., sputtering) at the temperature range now claimed by the applicant (i.e., at least about 600° C). In fact, there does not appear to be any original disclosure of a coating temperature range of at least about 600° C in conjunction with any coating method originally disclosed by the applicant. Newly added **Claims 16 and 17** require that the coating have a specific grain size (i.e., less than about 30 microns, particularly less than about 3 microns). After reviewing the specification as a whole, the examiner notes that there is no discussion or disclosure, either explicit, implicit, or inherent, of a coating having the aforementioned grain size. In fact, the grain size of the coating does not appear to have been discussed at all in the original disclosure. For the above reasons, the claims contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in

Art Unit: 1762

the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
9. Claims 1 – 7, 10 – 13, and 16 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), and in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495).

Art Unit: 1762

10. Regarding independent **Claim 1**, Toyoda et al. teaches a method of forming a coated part, specifically an aluminum nitride base material used as a susceptor in semiconductor fabrication processes such as CVD and dry etching (paragraphs [0001], [0007], and [0008]), the method comprising the step of coating the aluminum nitride base material with a magnesium fluoride coating "14" by a vacuum deposition method or a sputtering method (Figure 1, paragraphs [0006] – [0008], [0011] – [0012], and [0014]). This magnesium fluoride coating functions to protect the aluminum nitride component from corrosive fluorine-containing gases present during CVD or etching operations (i.e., the coating reduces corrosion of the component upon exposure to a corrosive environment) (paragraphs [0004], [0005], and [0008]). Toyoda et al. does not explicitly teach that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99%. Specifically, Toyoda et al. is silent regarding the density and purity of the magnesium fluoride coating, as well as the specific process conditions (e.g., temperature and pressure) used to deposit the coating. However, Toyoda et al. does teach that the magnesium fluoride target used in the deposition process has a purity of 99.5% (paragraph [0014]). This teaching would at least suggest to one of ordinary skill in the art that Toyoda et al. is concerned with and desires depositing a coating having a high purity. Ohashi et al. teaches an analogous process of coating a wafer-supporting member with a magnesium fluoride layer in order to protect the member from corrosion by halogen-containing gases (Abstract, Col.1, lines 53 – 67, Col.2, lines 1 – 8, and Col.3, lines 31 – 61). Ohashi et al. teaches that the method of producing the fluoride layer

should be such that defects and pin-holes are not formed in the film (Col.6, lines 15 – 27). Therefore, it would have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is free of defects and pin-holes (as taught to be desirable by Ohashi et al.) so that the coating provides the aluminum nitride component with optimum corrosion resistance. As a denser, more highly packed coating would be expected to have fewer defects (e.g., voids, holes) and pin-holes than a porous, less dense coating, it would also have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is sufficiently dense to minimize or eliminate defects, such as voids, and pin-holes in the coating. Itoh et al. teaches that, in the art of depositing a magnesium fluoride film by vacuum deposition, EB deposition, sputtering, etc., the packing rate / density of the film can be adjusted by controlling the degree of vacuum (i.e., the pressure) and the film-forming temperature during the process (Col.4, lines 64 – 67, Col.5, lines 1 – 24). In other words, Itoh et al. teaches that the temperature and pressure in a magnesium fluoride deposition process are result / effective variables that are used to control the density of the deposited film. The lower the degree of vacuum (i.e., the higher the pressure) and the lower the film-forming temperature, the lower the density of the deposited film (Col.5, lines 10 – 14). Consequently, the lower the pressure and the higher the temperature, the higher the density of the deposited film. Tomita et al. teaches that a magnesium fluoride film of low porosity (i.e., high density) can be deposited on a substrate by

heating the substrate to the order of 300° C during deposition (Col.4, lines 39 – 54). Additionally, Morton teaches that, by using a low pressure of 10^{-6} torr or less during a magnesium fluoride deposition process, a pure, dense magnesium fluoride film can be formed (e.g., without contaminants such as oxygen or hydrogen) (Col.3, lines 48 – 66). As such, it would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of Toyoda et al. through routine experimentation in order to obtain an optimized magnesium fluoride coating that has both a high purity and density (i.e., free of defects and pin-holes), as desired by the combination of Toyoda et al. and Ohashi et al. In doing so, one of ordinary skill in the art would have optimized the temperature to be, for example, on the order of 300° C (as taught by Tomita et al.) and the pressure to be, for example, 10^{-6} torr or less (as taught by Morton) during the magnesium fluoride deposition process because Tomita et al. and Morton et al. teach that these temperatures and pressures are suitable for depositing a dense, pure magnesium fluoride film, as desired by the combination of Toyoda et al. and Ohashi et al. The deposition of a magnesium fluoride coating at these process conditions would have inherently produced a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by Claim 1, because the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions that achieve the claimed coating density and purity (see, for example, paragraphs [0021], [0023], and [0025] of the

applicant's specification). Regarding **Claims 2 and 3**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton does not explicitly teach that the magnesium fluoride coating has a density of between about 85 – 90% (Claim 2) or about 100% (Claim 3). However, as fully set forth above in the discussion of Claim 1, it would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of Toyoda et al. through routine experimentation in order to obtain an optimized magnesium fluoride coating that has both a high purity and density (i.e., free of defects and pin-holes), as desired by the combination of Toyoda et al. and Ohashi et al. The exact density (e.g., between about 85 – 90%, or about 100%) would have been determined and optimized by one of ordinary skill in the art based upon the specific temperature and pressure used in the deposition process. Regarding **Claim 4**, Toyoda et al. also teaches that the corrosive environment comprises fluorine (paragraphs [0005] and [0008]). Regarding **Claims 5 and 6**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton also teaches that the coating step is performed at a pressure of not more than about 1×10^{-5} torr (Claim 5) and at a temperature of at least 250° C (Claim 6) (see the discussion of Claim 1 above). Regarding **Claim 7**, Toyoda et al. also teaches that the component part comprises aluminum nitride or aluminum (paragraphs [0001] and [0014]). Regarding **Claims 10 and 12**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton also teaches that the coating step comprises coating the component by chemical vapor deposition or physical vapor

deposition (e.g., sputtering) (paragraphs [0006] – [0008], [0011] – [0012], and [0014] of Toyoda et al.; Col.4, lines 64 – 67, Col.5, lines 1 – 24 of Itoh et al.). Regarding **Claim 11**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton also teaches that the chemical vapor deposition coating is performed at a temperature of at least about 300° C (Col.4, lines 39 – 54 of Tomita et al.).

Regarding **Claim 13**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton does not explicitly teach that the PVD coating is performed at a temperature of at least about 600° C. However, as fully set forth above in the discussion of Claim 1, it would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of Toyoda et al. through routine experimentation in order to obtain an optimized magnesium fluoride coating that has both a high purity and density (i.e., free of defects and pin-holes), as desired by the combination of Toyoda et al. and Ohashi et al. Regarding **Claims 16 and 17**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton does not explicitly teach that the coating has a grain size of less than about 30 microns, particularly less than about 3 microns. However, the deposition process conditions taught by the aforementioned combination of references (i.e., a temperature on the order of 300° C (as taught by Tomita et al.) and a pressure of, for example, 10^{-6} torr or less (as taught by Morton)) would have inherently produced a magnesium fluoride coating having the grain size claimed by the applicant, because the aforementioned magnesium fluoride deposition process conditions are identical

to the applicant's disclosed magnesium fluoride deposition process conditions used to obtain the claimed coating. Regarding **Claims 18 and 19**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton also teaches that the coating has a thickness of less than about 2 microns, particularly less than about 1 micron (Abstract; paragraphs [0012] and [0014] of Toyoda et al.).

11. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495), and in further view of Kubota et al. (USPN 5,643,483).
12. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claim 8** as set forth above in paragraph 10, except for a method wherein the component part (i.e., the susceptor / wafer holder of Toyoda et al.) has a surface finish of less than about 10RA (i.e., a roughness of 10 microinches, or 0.254 μm). Specifically, the aforementioned combination of references is silent regarding the surface finish (i.e., roughness) of the susceptor to be coated. However, Kubota et al. teaches that, in the art of semiconductor processing, the surface roughness of a susceptor surface is preferably as smooth as possible because a smooth surface provides better heat transfer to a workpiece mounted thereon and less contamination by the deposition of foreign materials (Col.1, lines 7 – 15, Col.3, lines 9 – 14, and Col.4, lines 5 – 13). A preferred surface roughness taught by Kubota et al. is 0.01 μm to 0.1 μm (i.e., less than 10

microinches). Therefore, it would have been obvious to one of ordinary skill in the art to perform the process of the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton on a susceptor having as smooth a surface as possible, including a surface finish of less than about 10RA, with the reasonable expectation of successfully and advantageously obtaining a susceptor that is corrosion resistant, provides good heat transfer to a substrate mounted thereon, and is not easily contaminated by the deposition of foreign materials.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495), and in further view of Ohmi et al. (USPN 6,215,806 B1).
14. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claim 9** as set forth above in paragraph 10, except for a method further comprising the step of annealing the magnesium fluoride coating at a temperature of at least about 600° C. Specifically, the aforementioned combination of references is silent regarding any further annealing step. However, as set forth above in paragraph 10, it would have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is sufficiently dense to minimize or eliminate defects, such as voids, and pin-holes in the coating (i.e., to form a coating having a high density). Ohmi et al. teaches that metal fluoride films can be densified by annealing the films

at a temperature of, for example, 600° C, after forming the films (Col.11, lines 51 – 61, Col.13, lines 22 – 28). This temperature is within the applicant's claimed range of "at least about 600° C". It would have been obvious to one of ordinary skill in the art to anneal the magnesium fluoride coating of the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton at a temperature of, for example, 600° C with the reasonable expectation of successfully and advantageously increasing the density of the film, thereby insuring that the coating is free from defects (e.g., voids) and pin-holes and provides optimum corrosion resistance.

15. Claims 13 – 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495), and in further view of Kawamata et al. (USPN 5,958,155).

16. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claim 13** as set forth above in paragraph 10, except for a method wherein the PVD coating (e.g., sputtering) is performed at a temperature of at least about 600° C. However, Toyoda et al. does teach using a sputtering method in general to deposit the magnesium fluoride film (Figure 1, paragraphs [0006] – [0008], [0011] – [0012], and [0014]). Kawamata et al. teaches that, in the art of sputter depositing a magnesium fluoride film, it is desirable to heat the magnesium fluoride sputtering target to a temperature ranging from 650 to 1100° C

(i.e., at least about 600° C) so that (1) the magnesium fluoride is ejected from the target in molecular form, thereby improving the composition of the deposited film, and (2) the sputtering yield is improved, thereby increasing the film formation rate (Col.3, lines 34 – 47, Col.4, lines 4 – 11, and Col.5, lines 1 – 8). Therefore, it would have been obvious to one of ordinary skill in the art to heat the magnesium fluoride sputtering target to a temperature ranging from 650 to 1100° C (i.e., at least about 600° C) in the process of the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton with the reasonable expectation of successfully and advantageously improving the composition of the deposited magnesium fluoride film and the film formation / sputtering rate, as taught by Kawamata et al. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claims 14 and 15** as set forth above in paragraph 10, except for a method wherein the PVD (e.g., sputtering) coating step is performed in an inert atmosphere, specifically an atmosphere comprising nitrogen. Toyoda et al. does teach using a sputtering method in general to deposit the magnesium fluoride film (Figure 1, paragraphs [0006] – [0008], [0011] – [0012], and [0014]) but is silent regarding the nature of the atmosphere. Kawamata et al. teaches that, in the art of sputter depositing a magnesium fluoride film, it is desirable to sputter deposit the film in an atmosphere comprising nitrogen (“an inert atmosphere”) in order to insure that the magnesium fluoride is ejected from the target in molecular form (not atomic form), thereby improving the composition of the deposited film (Col.3, lines 25 – 29, Col.5, lines 9 – 20 and 31 – 38; and Col.6, lines 15 – 16). Therefore, it would have

Art Unit: 1762

been obvious to one of ordinary skill in the art to perform the magnesium fluoride sputter depositing process of Toyoda et al. in a nitrogen (i.e., inert) atmosphere, as taught by Kawamada et al., with the reasonable expectation of successfully and advantageously insuring that the magnesium fluoride is ejected from the target in molecular form (not atomic form), thereby improving the composition of the resultant film.

17. Claims 1, 3 – 6, 10, 11, and 16 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al. (USPN 4,637,684) in view of Morton (USPN 6,162,495).
18. Regarding independent **Claim 1**, Tomita et al. teaches a method of forming a coated part, specifically a coated prism of a waveguide, the method comprising coating the prism with magnesium fluoride by evaporation (Abstract, Col.4, lines 4 – 7 and 36 – 54). Tomita et al. teaches that the coating process is performed by heating the substrate to the order of 300° C during the evaporation in order to form a film of low porosity (i.e., high density) and prevent any fluctuation of the refractive index of the film (Col.4, lines 49 – 54). Tomita et al. does not explicitly teach that the magnesium fluoride film has a density of at least about 85% and a purity of at least about 99%. Specifically, Tomita et al. is silent regarding the exact density and purity of the magnesium fluoride coating, as well as the specific pressure used during the deposition process. Morton teaches that, by using a low pressure of 10⁻⁶ torr or less during a magnesium fluoride deposition process, a pure, dense magnesium fluoride

film can be formed (e.g., without contaminants such as oxygen or hydrogen) (Col.3, lines 48 – 66). Therefore, it would have been obvious to one of ordinary skill in the art to deposit the magnesium fluoride film of Tomita et al. at a pressure of 10^{-6} torr or less with the reasonable expectation of successfully and advantageously using a deposition process pressure that leads to a pure, dense magnesium fluoride film, as desired by Tomita et al. The deposition of a magnesium fluoride film at these process conditions would have inherently produced a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by Claim 1, because the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions that achieve the claimed coating density and purity (see, for example, paragraphs [0021], [0023], and [0025] of the applicant's specification). The combination of Tomita et al. and Morton does not explicitly teach that the coating "reduces corrosion of said component part upon exposure to a corrosive environment". However, as the magnesium fluoride film of the combination of Tomita et al. and Morton is deposited on a "component part" and is both pure and dense (see the discussion above), the film would inherently reduce the corrosion of the component part (i.e., the prism / waveguide) upon exposure to a corrosive environment. Regarding **Claim 3**, the combination of Tomita et al. and Morton does not explicitly teach that the magnesium fluoride coating has a density of about 100%. However, such a density would have inherently been achieved by using the process conditions (i.e., temperature and pressure) taught by the combination of Tomita et al.

and Morton (see, for example, paragraph [0021] of the applicant's specification).

Regarding **Claim 4**, the combination of Tomita et al. and Morton does not explicitly teach that the corrosive environment comprises fluorine. However, as the magnesium fluoride film of the combination of Tomita et al. and Morton is deposited on a "component part" and is both pure and dense (see the discussion above), the film would inherently reduce the corrosion of the component part (i.e., the prism / waveguide) upon exposure to a corrosive environment of any sort, including a corrosive environment comprising fluorine. Please note that the applicant's claims do not require actually exposing the component part to a corrosive environment.

Regarding **Claims 5 and 6**, the combination of Tomita et al. and Morton also teaches that the coating step is performed at a pressure of not more than about 1×10^{-5} torr (Claim 5) and at a temperature of at least 250° C (Claim 6) (see the discussion of Claim 1 above). Regarding **Claims 10 and 11**, the combination of Tomita et al. and Morton also teaches that the coating is performed by chemical vapor deposition at a temperature of at least about 300° C (Col.4, lines 40 – 54 of Tomita et al.). Regarding **Claims 16 and 17**, the combination of Tomita et al. and Morton does not explicitly teach that the coating has a grain size of less than about 30 microns, particularly less than about 3 microns. However, the deposition process conditions taught by the aforementioned combination of references (i.e., a temperature on the order of 300° C (as taught by Tomita et al.) and a pressure of, for example, 10^{-6} torr or less (as taught by Morton)) would have inherently produced a magnesium fluoride coating having the grain size claimed by the applicant, because

the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions used to obtain the claimed coating. Regarding **Claims 18 and 19**, the combination of Tomita et al. and Morton also teaches that the coating has a thickness of less than about 2 microns, particularly less than about 1 micron (Col.4, lines 47 – 50 of Tomita et al., which teaches a coating thickness of "several 1000 Å", which is equivalent to "several hundred nm" and therefore within the applicant's claimed range of less than about 1 micron (i.e., 1000 nm)).

19. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al. (USPN 4,637,684) in view of Morton (USPN 6,162,495), in further view of Itoh et al. (USPN 6,287,683 B1).

20. The combination of Tomita et al. and Morton teaches all the limitations of **Claim 2** as set forth above in paragraph 18, except for a method wherein the magnesium fluoride coating has a density of between about 85 – 90%. However, Tomita et al. does desire to deposit a magnesium fluoride film having a low porosity in general (Col.4, lines 49 – 54). Itoh et al. teaches that, in the art of depositing a magnesium fluoride film by vacuum deposition, EB deposition, sputtering, etc., the packing rate / density of the film can be adjusted by controlling the degree of vacuum (i.e., the pressure) and the film-forming temperature during the process (Col.4, lines 64 – 67, Col.5, lines 1 – 24). In other words, Itoh et al. teaches that the temperature and pressure in a magnesium fluoride deposition process are result / effective variables

that are used to control the density of the deposited film. The lower the degree of vacuum (i.e., the higher the pressure) and the lower the film-forming temperature, the lower the density of the deposited film (Col.5, lines 10 – 14). Consequently, the lower the pressure and the higher the temperature, the higher the density of the deposited film. It would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of the combination of Tomita et al. and Morton (and therefore to optimize the film density) through routine experimentation in order to obtain a magnesium fluoride film that has a “low porosity” (i.e., a high density), as desired by Tomita et al. The exact density of the film would have been determined by a purveyor in the art, depending on the degree of “low porosity” desired.

21. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al. (USPN 4,637,684) in view of Morton (USPN 6,162,495), in further view of Itoh et al. (USPN 6,287,683 B1), and in further view of Ohmi et al. (USPN 6,215,806 B1).

22. The combination of Tomita et al., Morton, and Itoh et al. teaches all the limitations of **Claim 9** as set forth above in paragraph 20, except for a method further comprising the step of annealing the magnesium fluoride coating at a temperature of at least about 600° C. Specifically, the aforementioned combination of references is silent regarding any further annealing step. However, Tomita et al. does desire to obtain a magnesium fluoride film having a low porosity in general (Col.4, lines 49 – 54). Ohmi

et al. teaches that metal fluoride films can be densified by annealing the films at a temperature of, for example, 600° C, after forming the films (Col.11, lines 51 – 61, Col.13, lines 22 – 28). This temperature is within the applicant's claimed range of "at least about 600° C". It would have been obvious to one of ordinary skill in the art to anneal the magnesium fluoride film of the combination of Tomita et al., Morton, and Itoh et al. at a temperature of, for example, 600° C with the reasonable expectation of successfully and advantageously increasing the density of the film, thereby reducing the porosity of the film and preventing any refractive index fluctuation of the film, as desired by Tomita et al.

Response to Arguments

23. Applicant's arguments filed on 5/7/2004 have been fully considered but they are not persuasive.

24. Regarding Claims 1 – 7, the applicant argues that (1) Toyoda et al. is silent regarding the density and purity of the magnesium fluoride coating, and thereby does not teach or suggest a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%; (2) Ohashi is also silent regarding the density and purity of the magnesium fluoride coating; (3) Itoh is also silent regarding the density and purity of the magnesium fluoride coating; (4) Tomita is silent regarding the specific density and purity of the magnesium fluoride coating; and (5) Morton is silent with respect to the density and purity of the magnesium fluoride coating. As such, the applicant argues that there is no teaching or suggestion to

combine the references to obtain a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by independent Claim 1. In response, this argument is not convincing for the following reasons. To begin, the examiner admits that none of the aforementioned references explicitly teaches depositing a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%. However, the test of obviousness is not an express suggestion of the claimed invention in any or all references, but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them (*In re Rosselet*, 146 USPQ 183). In this case, the examiner maintains that the combination of references, when viewed collectively, reasonably suggests performing the applicant's claimed method. Briefly, Toyoda et al. is silent regarding the density and purity of the magnesium fluoride coating, as well as the specific process conditions (e.g., temperature and pressure) used to deposit the coating. However, Toyoda et al. does teach that the magnesium fluoride target used in the deposition process has a purity of 99.5% (paragraph [0014]). This teaching would at least suggest to one of ordinary skill in the art that Toyoda et al. is concerned with and desires depositing a coating having a high purity. As such, one of ordinary skill in the art would have been motivated to seek-out appropriate process conditions to deposit a magnesium fluoride film of as high purity as possible. Ohashi et al. teaches an analogous process of coating a wafer-supporting member with a magnesium fluoride layer in order to protect the member from corrosion by halogen-containing gases (Abstract, Col.1, lines 53 – 67, Col.2, lines 1 – 8, and

Col.3, lines 31 – 61). Ohashi et al. teaches that the method of producing the fluoride layer should be such that defects and pin-holes are not formed in the film (Col.6, lines 15 – 27). Therefore, it would have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is free of defects and pin-holes (as taught to be desirable by Ohashi et al.) so that the coating provides the aluminum nitride component with optimum corrosion resistance. The examiner maintains that a denser, more highly packed coating would be reasonably expected to have fewer defects (e.g., voids, holes) and pin-holes than a porous, less dense coating. As such, one of ordinary skill in the art would have been motivated to seek-out appropriate process conditions to deposit and form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is sufficiently dense to minimize or eliminate defects, such as voids and pin-holes, in the coating. Itoh et al., Tomita et al., and Morton are cited to show that the temperature and pressure (i.e., process conditions) utilized in a magnesium fluoride deposition process are known in the art to be result / effective variables, and the specific temperature and pressure values used by the applicant in the claimed and disclosed magnesium fluoride deposition process were known in the art to produce pure, dense magnesium fluoride films. Since one of ordinary skill in the art would have been motivated to seek-out and employ deposition process conditions that yield a dense, pure magnesium fluoride film, and Itoh et al., Tomita et al., and Morton teach such conditions, it would have been obvious to utilize such deposition conditions (i.e., temperature and pressure) to

obtain the protective magnesium fluoride film desired by Toyoda et al. Since these conditions are the same as the conditions utilized by the applicant, the resultant magnesium fluoride film would have inherently had the same density and purity as that of the applicant.

25. The applicant also argues that a desire to have a pinhole and defect-free film is not a suggestion or motivation to deposit a film having a density of at least about 85%, as required by Claim 1. In the same vane, the applicant states that the examiner erroneously equates the statement of Ohashi that the coating be free of defects and pinholes with having a density of at least about 85%, since a film need not be highly pure or dense in order to be free of defects and pinholes. In response, this argument is not convincing. To begin, it is important to note that the overall goal of Toyoda et al. is to provide a base material with excellent durability and corrosion resistance, and this is done by forming a metal (e.g., magnesium) fluoride layer on the base material (Abstract). While Ohashi's teaching that the magnesium fluoride layer should be free of defects and pinholes may not directly be a teaching of a film having a density of at least about 85%, the examiner maintains that a denser, more highly packed coating would be reasonably expected by one of ordinary skill in the art to have fewer defects (e.g., voids, holes) and pin-holes than a porous, less dense coating and to provide better durability and corrosion resistance, as desired by Toyoda et al. (e.g., because a less dense coating having higher porosity would be reasonably expected to allow more contaminants through to the base material (i.e., due to the pores / voids in the coating) than a more dense coating would).

26. Regarding Claims 1 and 3 – 6, the applicant argues that neither Tomita nor Morton teaches or suggests a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, and therefore the references cannot be combined in a manner which yields a magnesium fluoride coating having the density and porosity recited in Claim 1. In response, the examiner maintains that the combination of Tomita and Morton teaches performing the magnesium fluoride deposition process at the high temperature (e.g., around 300° C) and low pressure (e.g., 10^{-6} torr or less) disclosed and claimed by the applicant (see paragraph 18 above). The deposition of a magnesium fluoride film at these process conditions would have inherently produced a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by Claim 1, because the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions that achieve the claimed coating density and purity (see, for example, paragraphs [0021], [0023], and [0025] of the applicant's specification).

27. Also regarding Claims 1 and 3 – 6, the applicant submits that it is more difficult and expensive to deposit films at lower (versus higher) pressures, and as such, one of ordinary skill in the art would not have been motivated to deposit a magnesium fluoride coating (e.g., the coating of Tomita) at the low pressures disclosed in Morton when a satisfactory process existed that utilizes higher deposition pressures. In response, this argument is not convincing. To begin, please note that the fact that a combination would not have been made by businessmen for economic reasons does

not preclude a finding of *prima facie* obviousness (see MPEP 2145(VII)). Further, Tomita et al. teaches that the coating process is performed in order to produce a magnesium fluoride film of low porosity (i.e., high density) and prevent any fluctuation of the refractive index of the film (Col.4, lines 49 – 54), but is silent regarding the exact density and purity of the magnesium fluoride coating, as well as the specific pressure used during the deposition process. As such, one of ordinary skill in the art would have been motivated to seek-out and utilize a process pressure sufficient to yield a film of low porosity / high density. Morton teaches that, by using a low pressure of 10^{-6} torr or less during a magnesium fluoride deposition process, a pure, dense magnesium fluoride film can be formed (e.g., without contaminants such as oxygen or hydrogen) (Col.3, lines 48 – 66). This teaching provides sufficient motivation to utilize a pressure of 10^{-6} torr or less during the magnesium fluoride deposition process of Tomita et al., i.e., because such a pressure is advantageous in producing a pure, dense film, which is specifically desired by Tomita et al.

28. Regarding Claim 9, the applicant argues that the only heat treatment of a magnesium fluoride film described in Ohmi is in a temperature range of 150 to 450° C, not at least about 600° C, as recited in the claim. In response, although Ohmi does not explicitly teach heat treating magnesium fluoride at a temperature of at least about 600° C, Ohmi does teach that metal fluoride films can be densified by annealing the films at a temperature of, for example, 600° C, after forming the films (Col.11, lines 51 – 61, Col.13, lines 22 – 28). As such, it is the examiner's position that it would have been obvious to one of ordinary skill in the art to anneal the

Art Unit: 1762

magnesium fluoride film at any temperature sufficient to densify the film, including from 150 to 450° C, and even up to around 600° C, with the reasonable expectation of successfully and advantageously densifying the film, regardless of the exact temperature utilized in the annealing process. Please note that, in general, differences in temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating that such temperature is critical (see MPEP 2144.05(II)(A)).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Art Unit: 1762

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham
Examiner
Art Unit 1762



BRET CHEN
PRIMARY EXAMINER